

# Clothianidin Colony Feeding Study

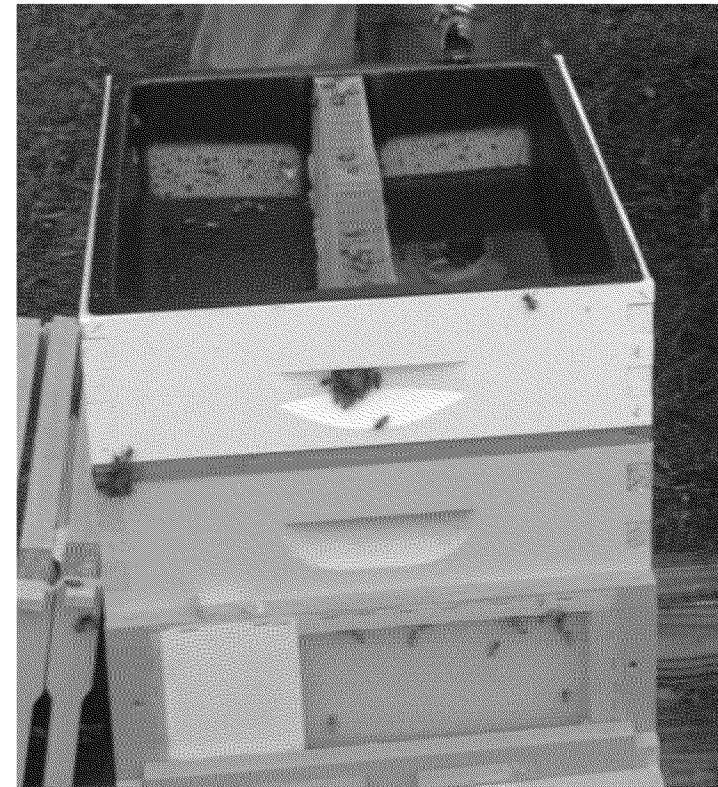


# Study Conclusions

- Overall NOAEC at 20 ppb based on colony condition assessments (pollen, brood, adults)
- Likely increased overwintering losses at 160 ppb. No apparent effect at 80 ppb; however, low survival in controls
- Generally similar pattern of effects with other neonicotinoids

# Colony Feeding Study Experimental Design

- New colonies initiated with package bees and new hive equipment in the Spring
- Clothianidin exposed to honey bee colonies via sucrose solution placed in hive top feeders
- 2 L of treated solution added to each hive twice a week for six weeks during Summer
- 5 treatment levels: 10, 20, 40, 80, 160 µg/L
- 12 apiary replicates (blocks)
- Each apiary has two control colonies and one colony for each treatment level

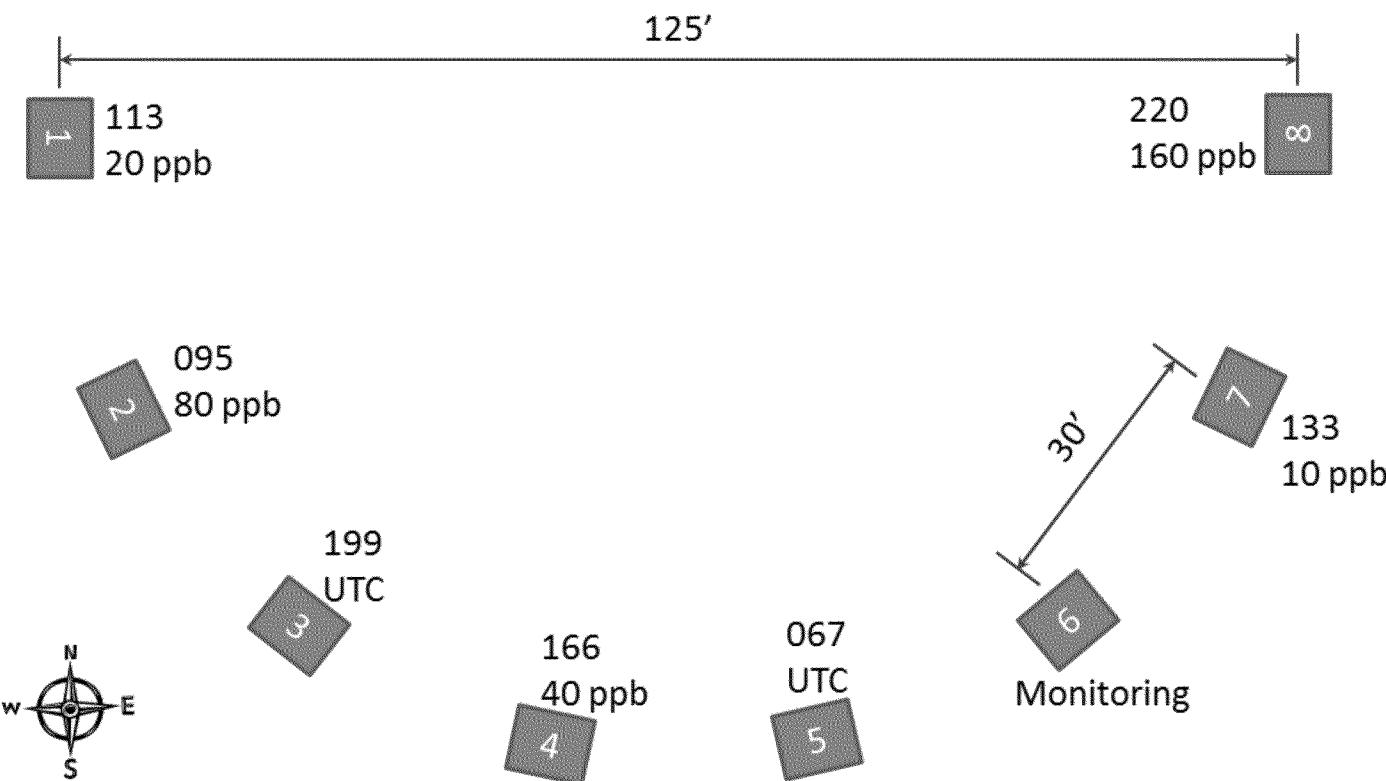


Hive top Feeder example (picture not from this study)

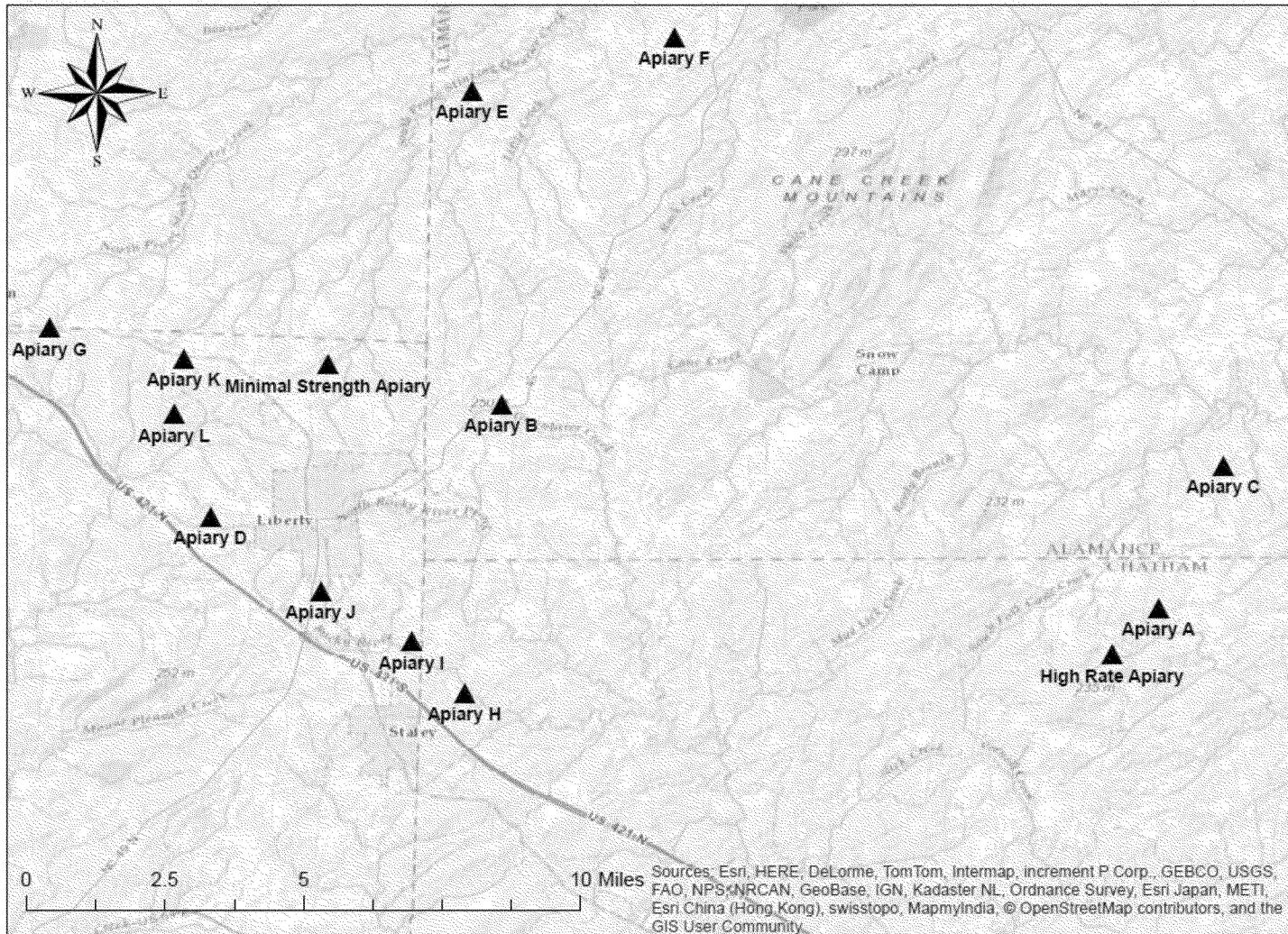
# Example Apiary Setup

Apiary A

Hive entrances  
face away from  
center of semi-circle



# Apiary Locations



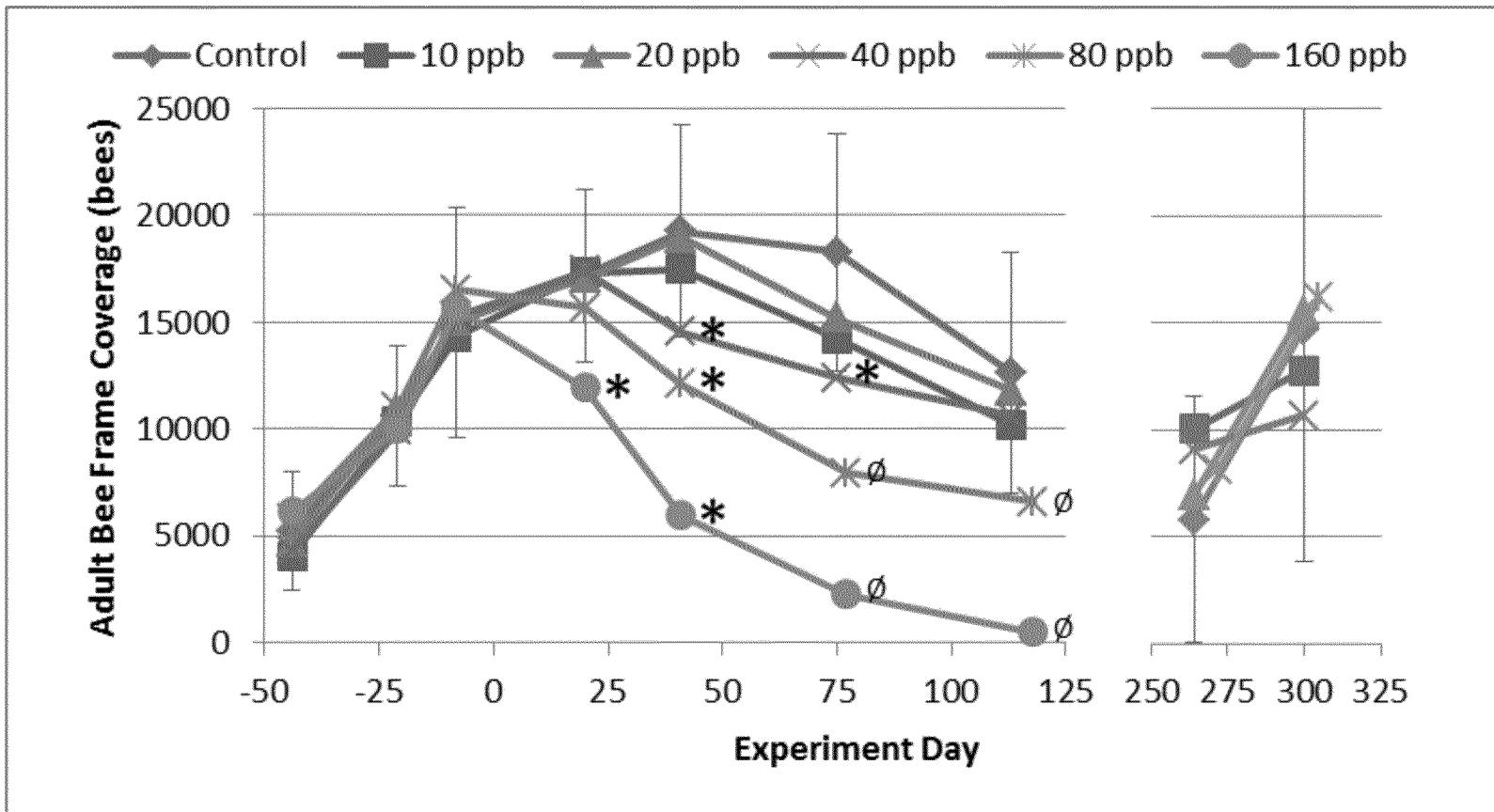
# Land Use Pattern Based on 2014 Cropland Data Layer

Land Use Category	Average of 12 Study Apiaries		
	1 mile radius	3 mile radius	5 mile radius
Corn	2.5%	3.1%	2.7%
Soybean	3.3%	4.5%	4.4%
Other Crops	0.9%	0.7%	0.6%
Developed, Open Space	6.0%	5.7%	5.3%
Developed, Low-High Intensity	3.0%	2.7%	2.3%
Forest	44.4%	45.7%	47.8%
Grassland/Pasture/Hay	38.8%	36.1%	35.2%
Water/Barren/Shrub/Wetland	1.1%	1.5%	1.6%

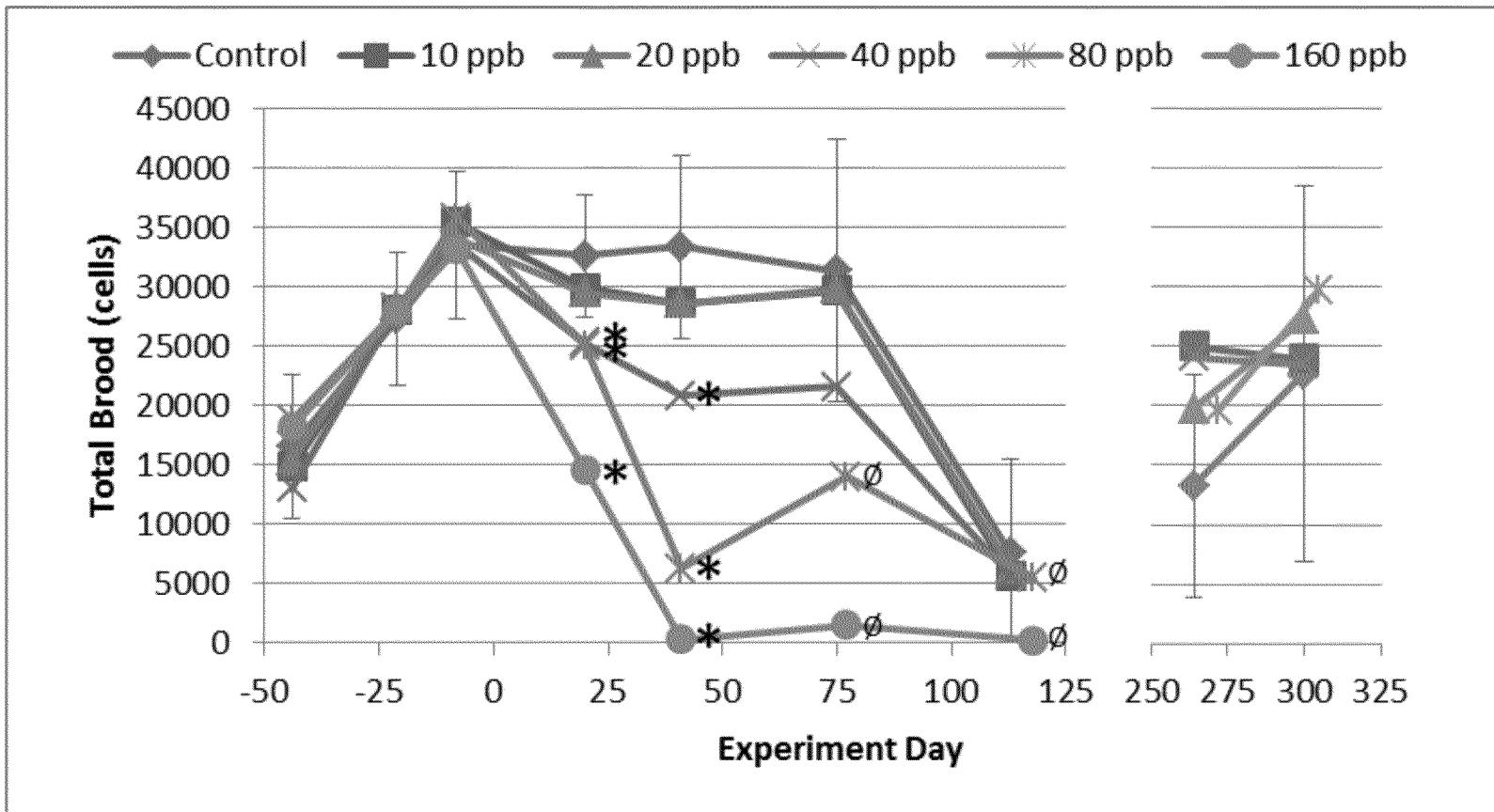
# Monitoring Hive Results

- Pollen ID predominant types: clover, sweetclover, crepe myrtle, plantain, Vitis, magnolia, corn, Virginia creeper, Amaranth, asters
- Pollen residues (n=42):
  - 203 ppb clorothalonil (Jul 1)
  - 119 ppb carbaryl (Aug 13)
  - 2010 ppb propiconazole (Oct 20)
- Nectar residues (n=59): none detected

# Adult Bee Frame Coverage

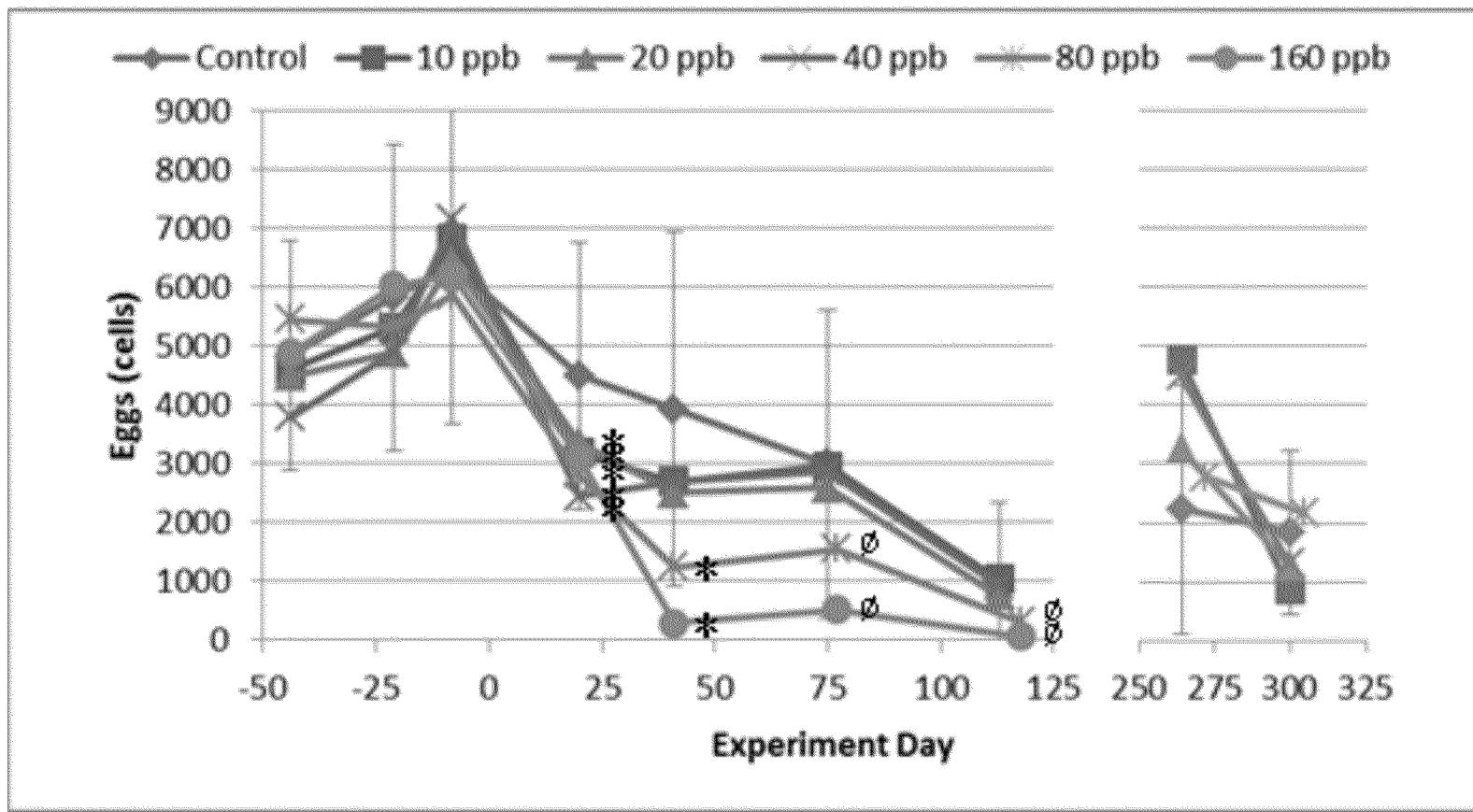


# Total Brood



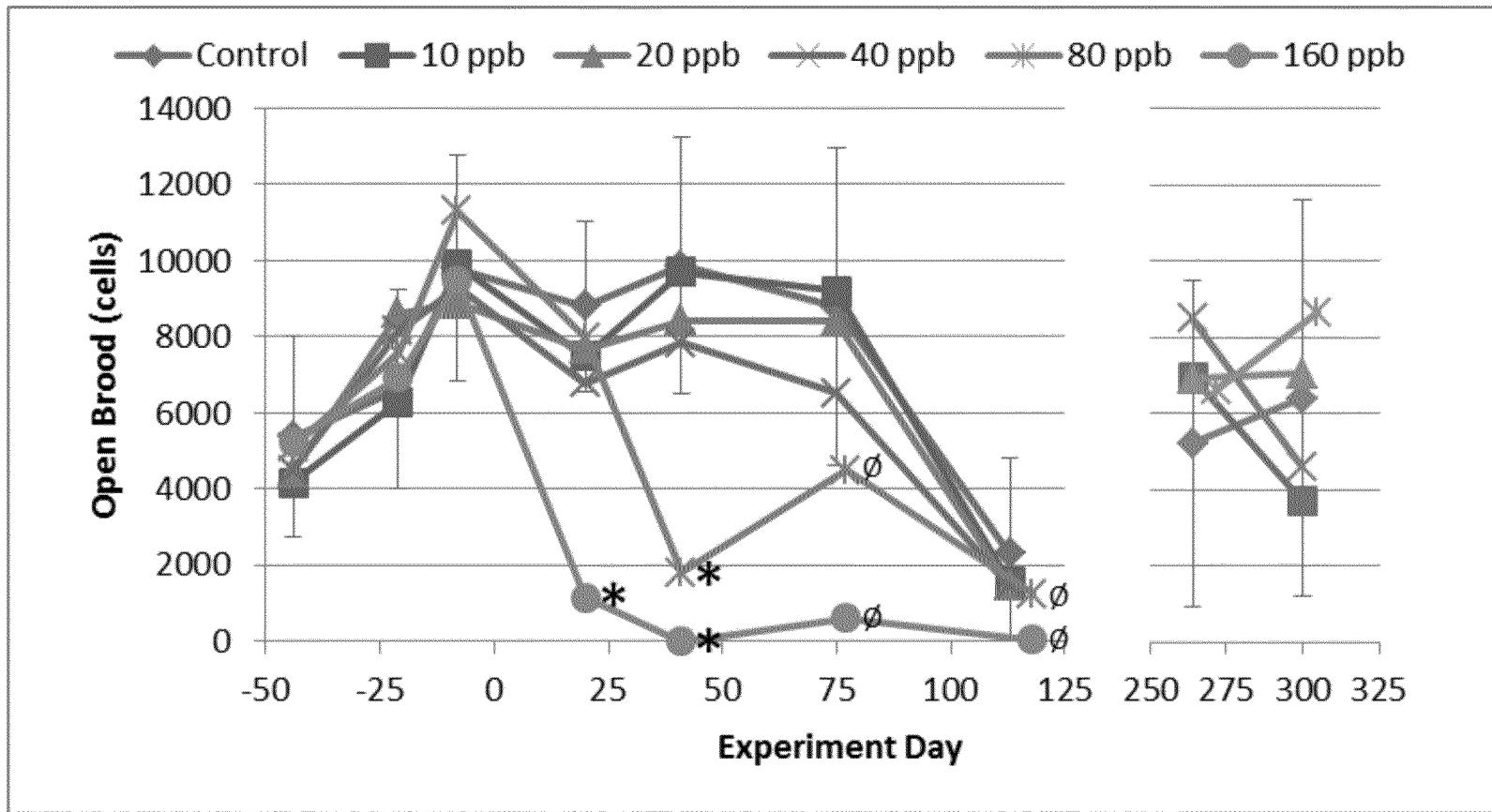
\* statistically significantly lower than in the control group, Ø not included in statistical analysis

# Eggs

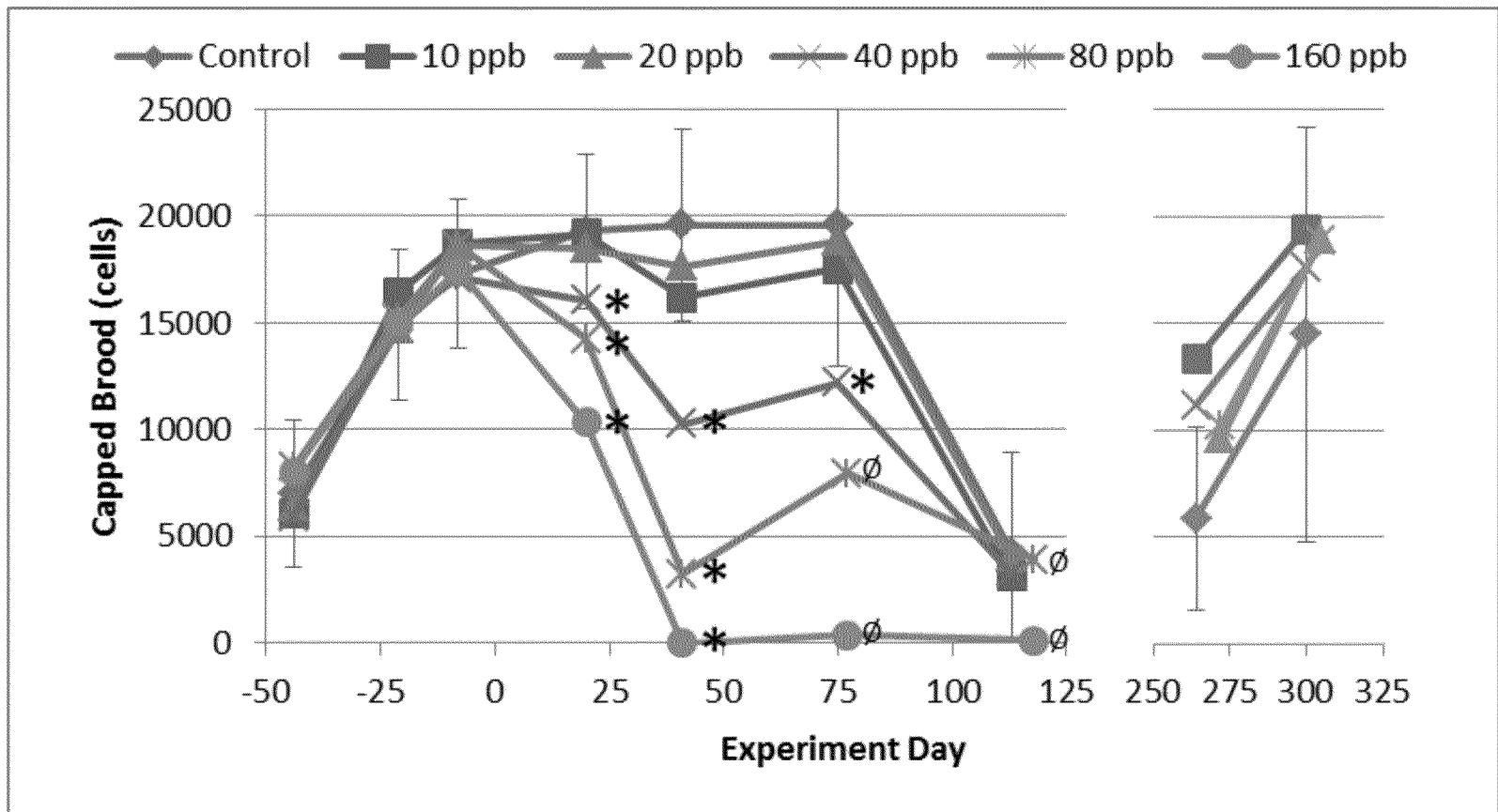


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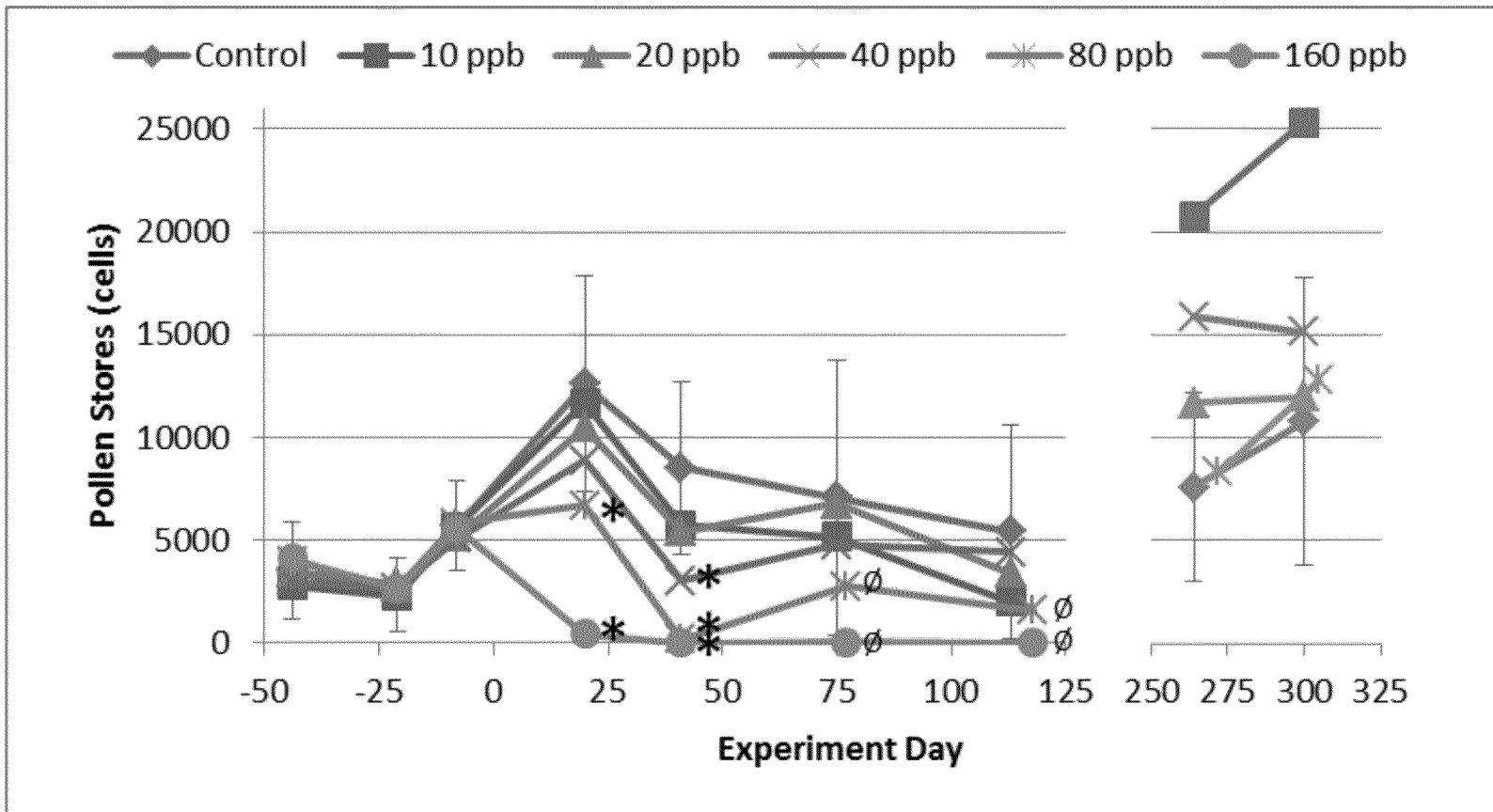
# Open Brood (Larvae)



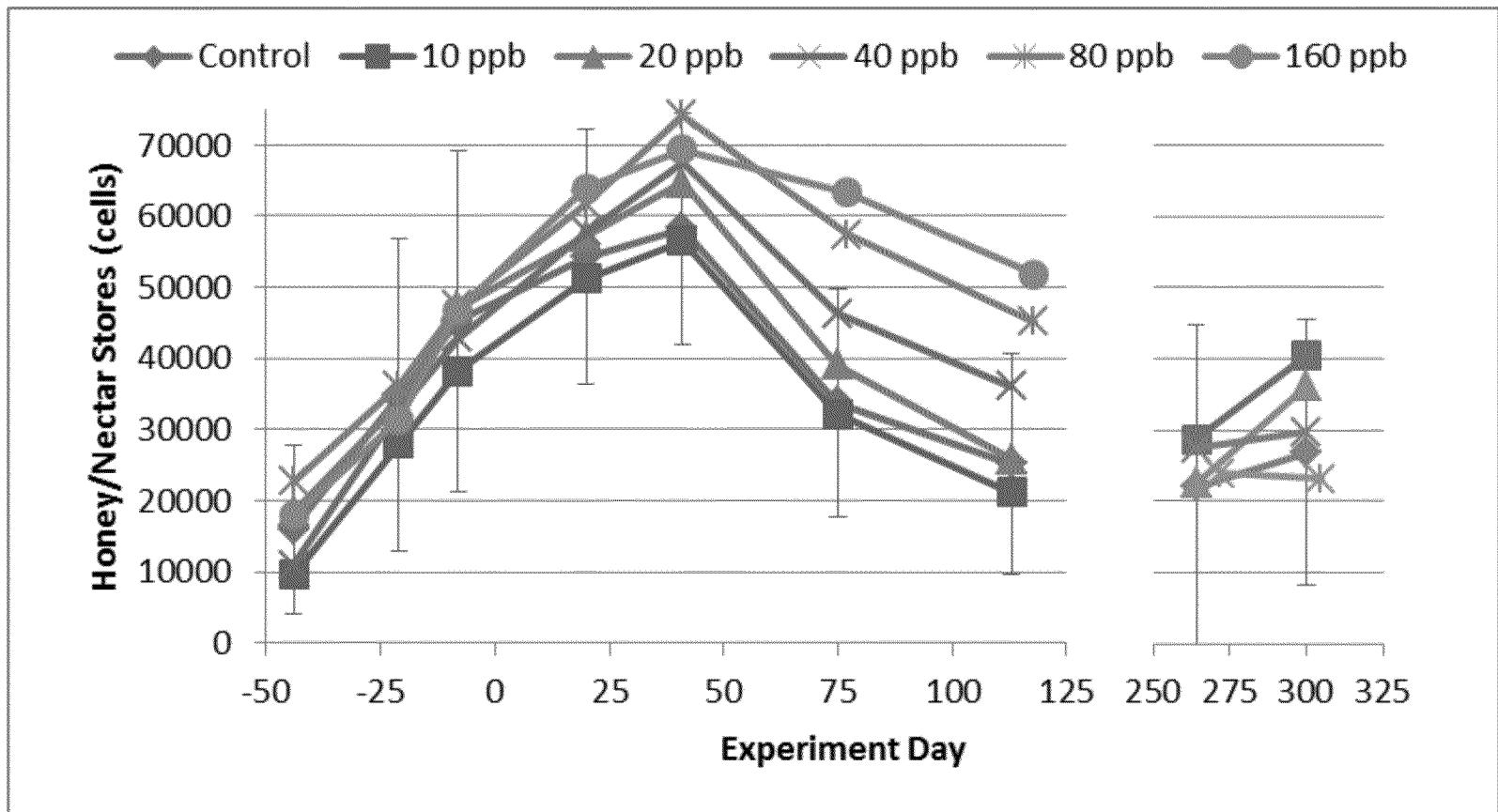
# Capped Brood (Pupae)



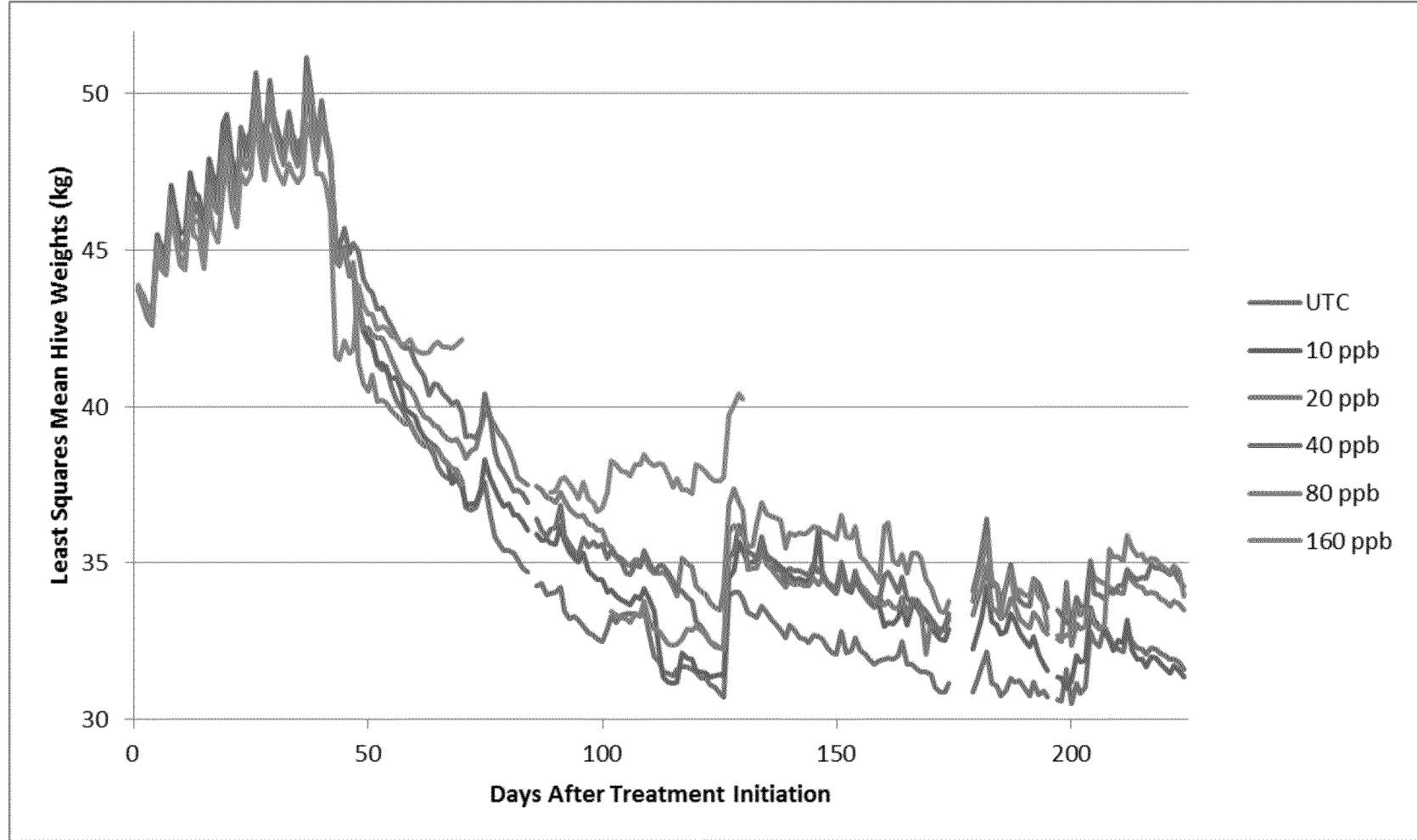
# Pollen Stores (Beebread)



# Honey/Nectar Stores



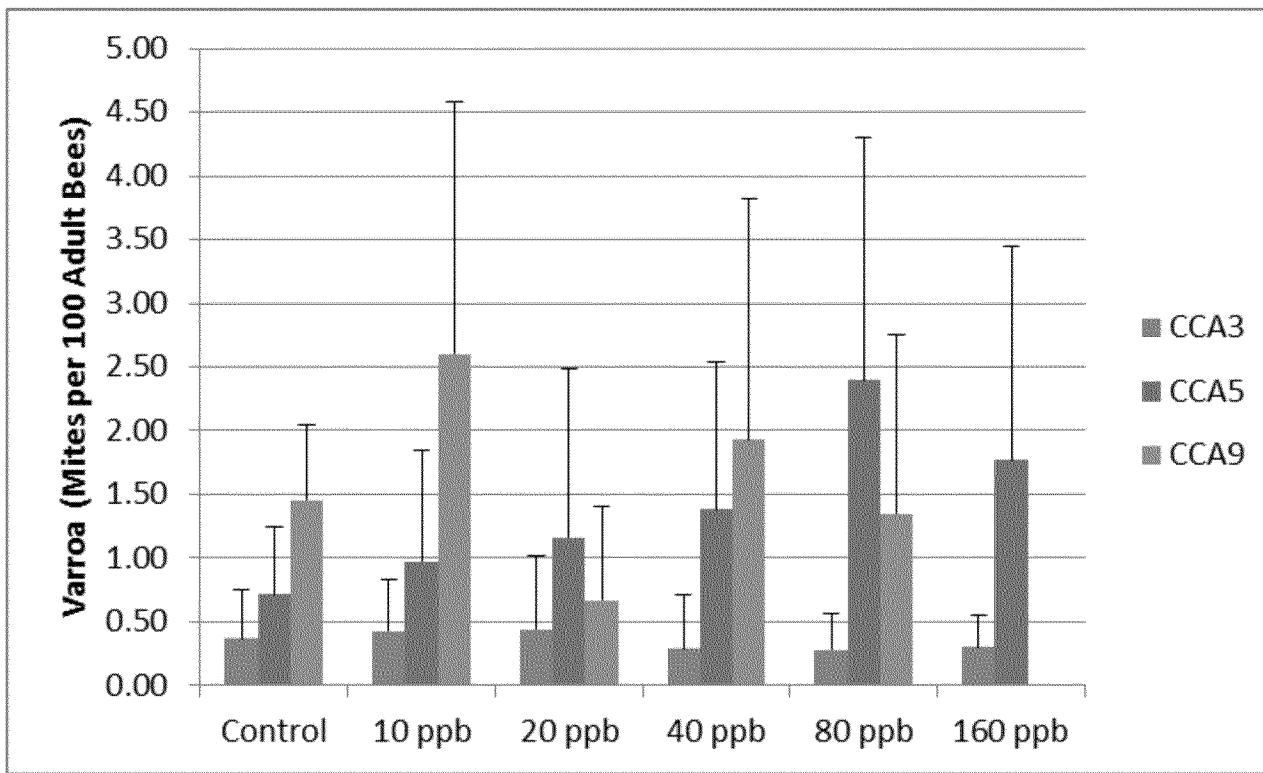
# Hive Weights



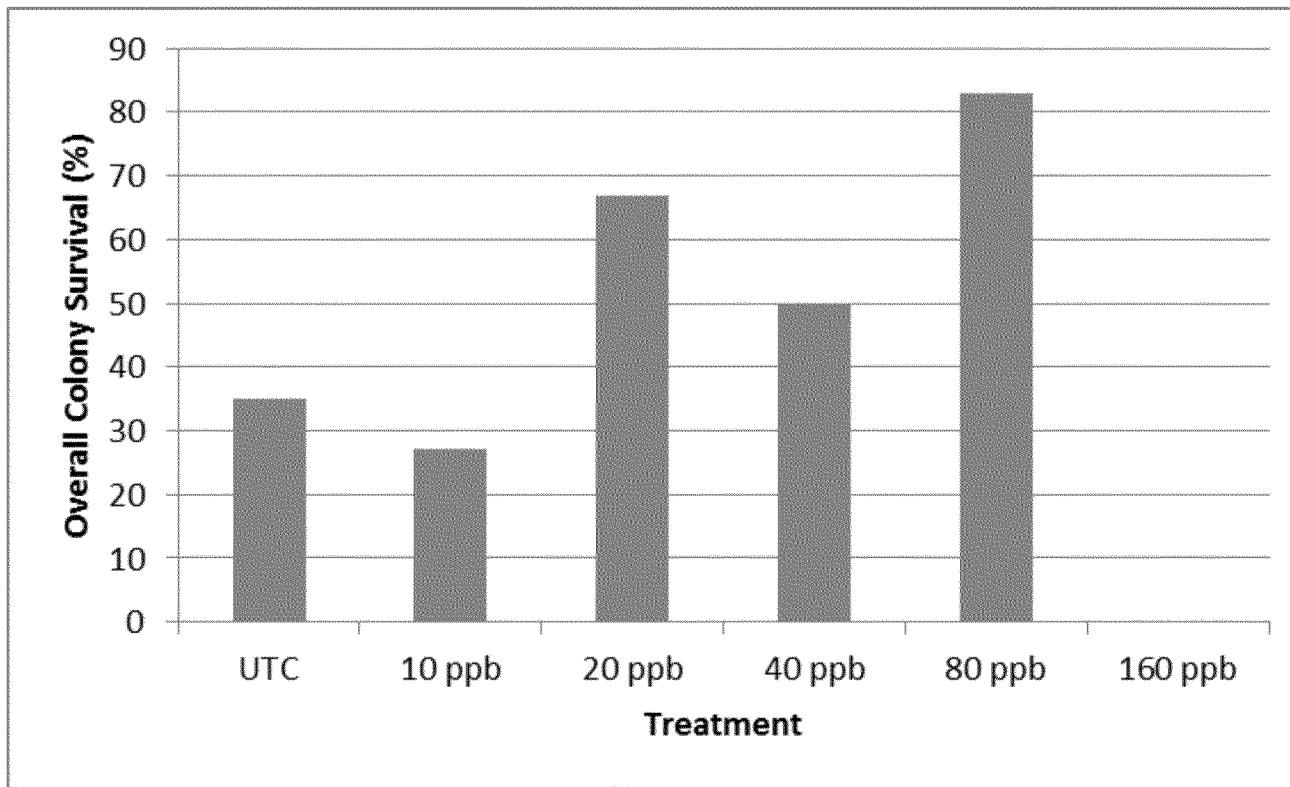
# Median Clothianidin Residues ( $\mu\text{g}/\text{kg}$ )

Hive Matrix	Uncapped Nectar	Capped Honey	Beebread	
Assessment	CCA4	CCA5	CCA7	CCA9
Control	<LOD	<LOQ	<LOD	<LOD
10 ppb	3.9	8.7	2.1	<LOQ
20 ppb	9.6	15.8	10.6	2.0
40 ppb	13.0	31.9	7.0	5.9
80 ppb	19.7	56.6	48.2	14.4
160 ppb	28.9	102.2	36.6	--

# Varroa



# Overall Colony Survival

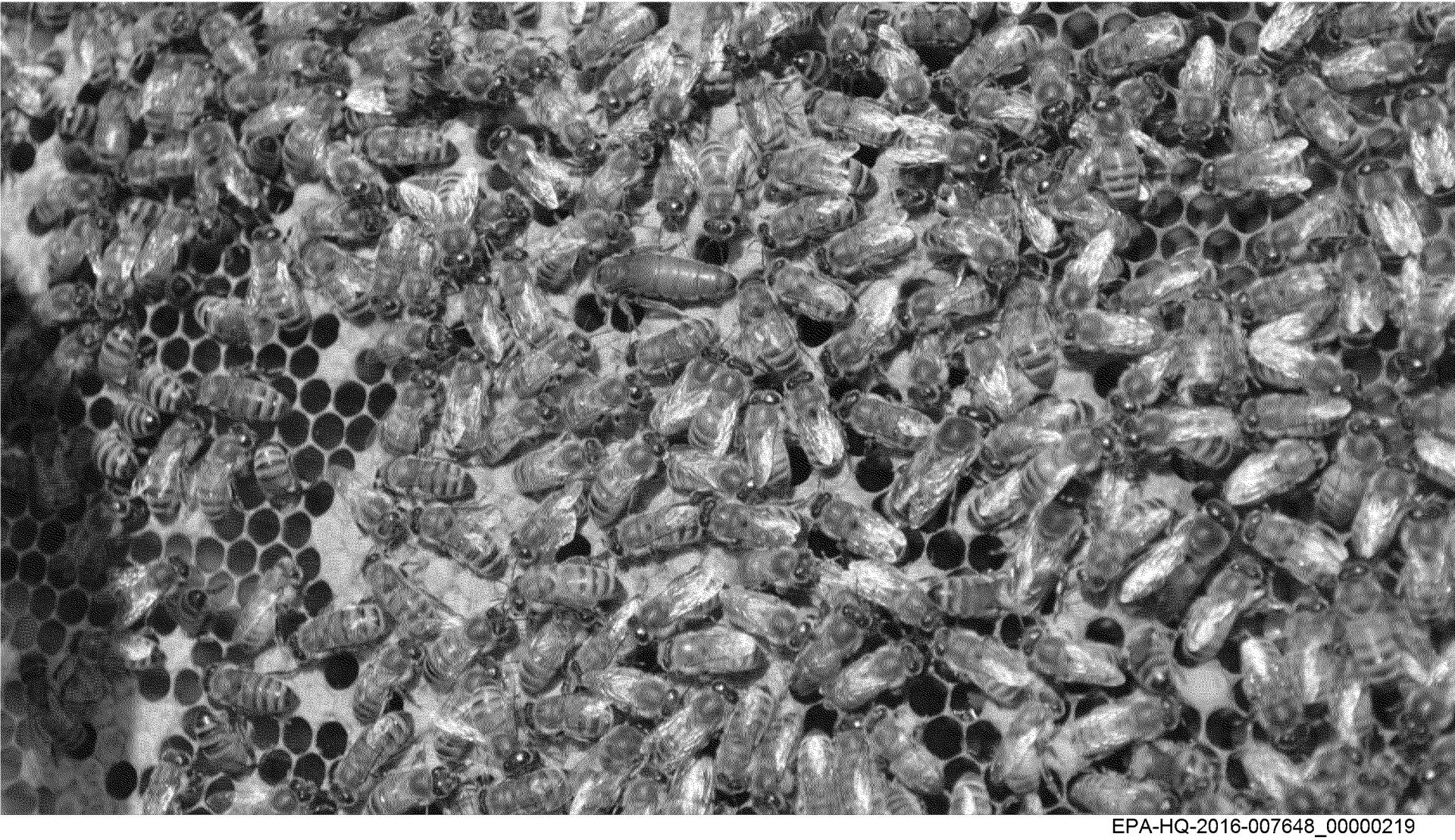


All surviving colonies at the 160 ppb treatment level were destroyed before the overwintering period

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# Questions?



# Thank you for your attention!

